APPENDIX C

DRINKING WATER SUPPLY SOURCE WATERS AND HERBICIDES

The Department of Natural Resources maintains a database called HRBSUR.DBF which contains over 6,800 observations of herbicide levels in surface waters (lakes and streams) and finished (treated) drinking water within the state of Missouri. Each record represents a monthly average herbicide concentration and may be composed of one or more samples taken during that month at that location.

Most of the data in this database is sampling of finished waters by the Missouri DNR Public Drinking Water Program (1826 records) and Novartis Corporation (3087 records). Others supplying information for this database include DNR Water Pollution Control Program, Natural Resources Conservation Service, U.S. Geological Survey, University of Missouri and several municipal public water suppliers. This database was queried for observed concentrations of commonly used herbicides in streams and reservoirs used as drinking water supply sources. For atrazine, because there were many observations in most streams or reservoirs only data for raw (untreated) water, was used. At many locations both raw and finished water data was used to characterize cyanazine levels. Only these two herbicides, atrazine and cyanazine, approached or exceeded allowable standards or health advisory levels in any drinking water supply source water. Data are summarized in the table below.

Table C-1, Average Atrazine and Cyanazine Concentrations
In Raw and Finished Drinking Water Supplies in Missouri

Waterbody[1]	**Sample Type[2]**	**No. of Samples[3]**	**Period of Record**	**Atrazine (ug/l)**	**Cyanazine (ug/l)**
Vandalia Res.	R/F	39	1995-99	**5.74**	0.00
La Belle #2 Res.	R	45	1991-99	**3.72**	**5.57**
Monroe City Rte J Res.	R	80	1990-99	**3.94***	**3.37***
Unionville Old Res.(Mahoney)	R/F	19	1995-99	**3.46**	0.20
Baring Res.	R	10	1994-99	**3.19**	0.43
Edina Res.	R	64	1992-99	**3.09**	**2.17**
Wyaconda Res.	R/F	36	1988-99	**3.08**	0.00
Long Branch Res.	R	40	1991-99	1.79*	**1.25***
Monroe City South Res.	R/F	48	1996-99	2.88	**2.16**
Green City Res.	R/F	8	1991-99	1.14	**1.16**
Grindstone Res.(Cameron)	R	14	1996-98	2.95	0.05
Smithville Res.	R	85	1988-99	2.84	0.47*
Cameron No. 3 Res.	R	38	1991-98	2.70	0.20
Marceline	R/F	30	1991-99	2.54	0.58
Higginsville Res.	R/F	69	1992-99	2.44	0.27

Table C-1, continued

Waterbody[1]	Sample Type[2]	No. of Samples[3]	Period of Record	Atrazine (ug/l)	Cyanazine (ug/l)
Mark Twain Res.	R/F	50	1995-99	2.42	0.32
Unionville New Res. (Lake Thunderhead)	R/F	83	1992-99	2.29	0.20
Sugar Creek Res.(Moberly)	R	84	1992-99	2.19	0.93
Pape Res. (Concordia)	R	65	1992-99	2.07	0.00
Dearborn Res.	R	76	1994-99	1.95	0.25
Jamesport Res.	R/F	22	1991-99	1.84	0.37
Drexel Res.	R/F	54	1994-99	1.73	0.00
Miami Cr. (Butler, Bates #2)	R/F	48	1992-99	1.64	0.00
Shelbina Res.	R/F	83	1991-99	1.46	0.31
Spring Fork Res. (Sedalia)	R/F	46	1995-99	1.37	0.00
Harrisonville Res.	R	8	1992-99	1.12	0.00
Bucklin Res.	R/F	24	1997-99	1.09	0.93
Hamilton Res.	R/F	33	1996-99	0.47	0.87

(1) Unless listed separately in this table, multiple waterbodies serving a single water supply are considered to be a single waterbody.
(2) R = raw (untreated water), F = finished (water treated by a drinking water treatment plant).
(3) This is the number of samples analyzed for atrazine. The number of samples analyzed for cyanazine is less.
* This mean was adjusted to reduce seasonal bias caused by a large percent of the samples being collected in one season of the year.

Discussion

Since the database combines data from many different monitoring programs, the amount of data and the proportions of raw and finished water vary considerably between waterbodies. The “No. of Samples” Column refers to the number of raw water atrazine samples. A “Sample Type” column entry of “R” means that both atrazine and cyanazine averages were calculated only from raw water data, and generally the number of observations for cyanazine is less than for atrazine. If the column entry is “R/F” it means the atrazine average was calculated from raw water data only and the cyanazine average was calculated from both raw and finished water samples because there were too few raw water samples.

Based solely on raw water sampling, ten waterbodies (Vandalia, La Belle, Monroe City Route J, Unionville Old Reservoir (aka Lake Mahoney), Baring, Edina, Wyaconda, Long Branch, Green City and Monroe City South reservoirs) exceed either the 3 ug/l atrazine drinking water source standard or the 1 ug/l cyanazine lifetime health advisory level. In addition, there are several

waterbodies including(Grindstone, Cameron No. 3, Marceline, Higginsville, Mark Twain and Sugar Creek reservoirs, which have long term atrazine or cyanazine levels near the maximum allowable levels for these herbicides.